PROSPECTUS

OF THE

CHESTATEE HYDRAULIC COMPANY.

AND

REPORT OF WILLIAM P. BLAKE,

GEOLOGIST AND MINING ENGINEER,

UPON THE

GOLD PLACERS,

OF A PART OF

LUMPKIN COUNTY, GEORGIA,

AND THE

PRACTICABILITY OF WORKING THEM BY THE HYDRAULIC METHOD, WITH WATER FROM THE CHESTATEE RIVER.

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PROSPECTUS.

INTRODUCTION.

THE methods heretofore employed for extracting gold from the earth have of late been superseded, where the conditions permitted, by a new process. This method brings to bear, under the action of a natural law of hydraulics, a great application of power, at an expense, in artificial appliances, relatively small. Where nature labors for us, the work is cheaply done.

Thus, the mill that grinds out its grist by the power of the running stream, cheapens the cost of its labor greatly below the cost of the work done by the mill working by steam power, and infinitely below the cost of that patriarchal system practised in Biblical lands, where the woman sits at the stone grinding the modicum of meal by hand.

Gold mining on the placers, has usually been practised upon a system analogous to this latter method of grinding the grist; the miner by patient industry laboriously shovelling out the earth, placing it in his cradle, and washing out the gold. Another method practised is the crushing the quartz rock by heavy and expensive machinery, and from the pulverized mass extracting the gold. This method is analogous to the grist-mill worked by the steam engine.

What will probably be recognized as the perfection of economical processes for extracting gold from the earth, is another which is analogous to the grinding that is rapidly and cheaply done by the water power of the freely running stream.

EXPLANATION OF THE PROCESS.

By this process the water of a stream is withdrawn by canal or aqueduct, and thence feeds any required number of hose, not exceeding in capacity the volume of disposable water. Through the hose, played against the bank of earth, as the fireman "plays away" on the blazing house, the water is made to disintegrate the soil, and the gold is found on the bed-rock, or in the bottom of the flume, into which the loosened earth and water are constantly falling while the hose is in operation. A hundred tons of earth sometimes come tumbling down at once, under the powerful action of the water.*

This is the *Hydraulic Method*, and originated in California. By it one hose disintegrates the soil, and renders accessible the imbedded gold to an extent exceeding that accomplished by 20 men under the old process. By this process "the whole art of placer mining," says Professor Blake, "has been revolutionized in California." Aqueducts have been constructed at the cost of millions of dollars, and the water delivered on the mining claims, at prices per inch that yield enormous dividends on the cost of the works.

This process has lately been employed in the gold region of North Carolina, with favorable results; though the application there is yet in its infancy, and imperfect in its organization. Districts previously unavailable for want of water are, by this new method, made to yield rich returns. *One effect of this method is to change the uncertain, lottery-like character of mining, to the conditions of a regular business, yielding its assured and certain average of monthly or quarterly returns:* the conditions of quantity or yield being determined mainly by the number of hose at work, not solely by chance, or the luck of finding or missing rich "leads." This is owing to the great extent of surface that is

* See Democratic Review for July, 1857, p. 36.

worked in a given time, and the thorough extraction of all the gold contained in it, the whole earth paying or yielding gold down to the bed-rock; while, by the old method, the lower layer only of earth could be washed with profit. The entire soil of the placers, when any considerable extent of surface is embraced, containing throughout a certain average amount of gold, which is so rapidly reached and so cheaply mined by this process, as to pay well for the labor expended during any consecutive number of days. The entire labor is performed by the simple action of the water, and millions of gold will be gathered by this process, that otherwise would never have been produced, to add to the material wealth of the world.

The results of quartz mining in California and elsewhere, indicate the necessity for a yield of not less than $ per ton of rock, in order to make the labor profitable. In placer mining, by the hydraulic process, an average yield of four cents per ton of earth pays for the washing.

More than thirty millions of the gold now annually gathered in California is by this process.

OBJECTS OF THE COMPANY.

The favorable results elsewhere obtained have directed attention to the comparatively new and rich district of gold deposits in Georgia. In this district the topographical features are more favorable than in the other gold-producing districts of this country, the water being more abundant with a greater power of fall.

THE CHESTATEE HYDRAULIC COMPANY have procured through the Hon. Thomas L. Clingman and Dr. M. H. Van Dyke, of North Carolina, the right to the waters of the Chestatee, the right of way for the canals, and the right to take the gold from the lands, and are engaged in carrying the waters of that river by canal through a district rich in gold deposits, and hitherto comparatively unworked for want of water. The entire waters of the

Chestatee will be made available for supplying a vast number of hose, washing an immense district of country.

How far the diversion of water of the river will enable the Company to prosecute the working of the river-bed, and thus collect the accumulated deposits of ages, may form a subject for estimate at a future time.

As the area that may be reached by the hose tapping the canalled waters of the Chestatee is immense, the Company will find a market for rights to use the water sought after by individual owners of the soil lying within reach. From this source the revenue will perhaps be as great as from the direct mining operations of the Company. The works of the Company are locally regarded as a public benefit, furnishing, as they do, remote districts with those supplies of water which nature had denied.

In California the Legislative Committee on mining interests lately reported that "if right of way be granted to such canals, your committee are fearful that it will result in a great monopoly —that capitalists will purchase all the districts and canals already constructed, and will claim and occupy all the available water in the mining districts, and thus control the whole mining interests of the State, by having it in their power to fix the price of water in the mines, which can be rated so high that miners will be obliged to abandon their claims for the want of the means of subsistence, and the claims then become the prey of the moneyed water monopolists, who, by means of hired labor, may reap a greater profit from the use of the water than could be obtained by a direct sale of the same to the independent miner at a reasonable rate."

Such, since the revolution in placer mining wrought by the hydraulic process, is the importance and value attached in California to such a monopoly of right of way as is possessed by this Company; a monopoly not procurable in California, that being essentially a gold-mining country, and privileges affecting mining

interests being watched with extreme jealousy. A monopoly, regarded on the Chestatee, however, is a public blessing—the associated capital of the Company furnishing the land-owners, where they hire the water, with facilities that their own means would never have procured, and the want of which had prevented their harvesting the crop of mineral wealth which nature had deposited in the soil. When the Company washes on lands not its own, the royalty of ten per cent. of the gold paid to the owners of the soil, is satisfactory compensation that connects their interest with the Company. In this manner the population of the district becomes joint partners of this Company, and deeply interested in the success of the enterprise.

The Company, on undertaking the enterprise, appointed a Commission of Examination. They employed Professor William P. Blake, an eminent geologist and mineralogist, and late of the Government expedition to determine a railroad route to the Pacific, whose report thereon, printed by order of Congress, has just been published under direction of the War Department. The Commission spent several weeks in examining the deposits throughout the Chestatee district, and the available water resources of that river, and in investigating the nature and validity of the grants obtained for the Company. Their familiarity with the character of the work as prosecuted in California and North Carolina, had prepared them to judge of the availability of the Chestatee for the enterprise.*

PROBABLE PRODUCTION AND PROFITS.

The waters conveyed by the Company's canal will be unfailing and abundant. The secured grants ensure the diversion of the Chestatee, and the construction of the canals at such an elevation,

* See Blake's Report to Government, and see Mining Mag. for May, 1858.

that the waters may be led over a gold district embracing more than 20,000 acres of placers. The capacity of the water will supply 500 hose, each throwing a stream of water 1½ inches in diameter. Each hose may be expected to wash from $20 to $100 per day. In North Carolina, under the conditions as compared with Georgia of inferiority in quantity of gold, a scanty supply of water, with less of head, and in placers that had been previously twice or thrice worked, the Commission found the yield to range from six to ten dollars per day to the hose-pipe of capacity only one-fourth of that which they saw in use at another mine, and which is designed to be used by this Company. In another placer the old sluicing process brought out $640 in 35 days, with the labor of 10 men. Had the hydraulic hose been employed, the $640 would have been produced in 6 days, with the labor of 2 men. This indicates a yield of over $100 per day to each hose.

If we estimate an average production of $20 per day for each hose employed in the Chestatee district, we assume a result below what is likely to be the average yield.

The Company at the beginning of 1859 will commence working upon a short canal, having capacity for 50 pipes. This canal is now being constructed, under contract with responsible parties, to be completed on 1st January, 1859, and furnished with all the pipes and fixtures necessary for immediate working.

ESTIMATE OF THE PRODUCT OF GOLD FROM THE USE OF 50 HOSE PIPES.

1 six-inch hose, 1½ inch nozzle, 100 feet head, with 2 men, is equal to the labor of 20 men employed in ground sluicing.

20 men now earn an average of $20 per day in North Carolina.

The hose may be expected to work 261 days of the year, deductions being made for Sundays and for one day in each week, when repairs and bad weather may induce a suspension of operations.

50 hose-pipes, working 261 days a-year, earn, at $20 each, - -	$261,000
100 men on 50 hose for 261 days, at 75 c. per day, cost -	$19,575

Wear and repairs of stock, say $25 per day,		$6,525	
1 Superintendent,	$3,000		
5 Captains, at $1.50 per day,	1,825		
Clerk to Superintendent and incidentals in Georgia,	1,000		
		5,825	
Expenses of New York Office and incidentals,		7,500	
			39,425
			$221,575
Royalty or Tolls to owners of Gold lands,			26,100
Net profits of working 50 hose,			$195,475

The net results of the first year's working will enable the Company during the year 1859 to construct the larger canal of 500 pipe capacity, and pay a dividend on the entire capital stock.

With the two canals the Company expect the following year to work 200 pipes, when the result is estimated to be as follows:

ESTIMATE OF THE PRODUCT OF GOLD FROM THE USE OF 200 HOSE-PIPES.

200 hose-pipes, working 261 days a-year, earn			$1,044,000
400 men employed 261 days, at 75 cents,		$78,300	
Wear and repairs of stock, &c., $75 a day,		19,575	
1 Superintendent,	$3,000		
20 Captains,	7,300		
Clerk and incidentals,	1,000		
		11,300	
Expenses of New York and incidentals,		7,500	116,675
			$927,325
Royalty or Tolls to owners of Gold lands,		$104,400	
Cost of 100 additional hose,		11,000	
			115,400
Net profits of working 200 hose,			$811,925

The third year the Company will work 300 pipes with the following results:

ESTIMATE OF THE PRODUCT OF GOLD FROM THE USE OF 300 HOSE-PIPES.

300 hose, working 261 days a-year, will earn		$1,566,000
600 men employed 261 days, at 75 cents,	$117,950	
Wear and repairs of stock, &c., $100 per day,	26,100	

1 Superintendent,	$3,000		
30 Captains,	10,950		
Clerk and incidentals,	1,000		
		14,950	
Expenses of office in New York and incidentals,		7,500	
			166,500
			$1,399,500
Royalty or Tolls to owners of Gold lands,		$156,600	
200 additional hose-pipes,		22,000	
			178,600
Net profits of working 300 hose,			$1,220,900

And so on, until the operations may reach the capacity of 500 pipes, as estimated by Professor Blake, when the result will be as follows:

ESTIMATE OF THE PRODUCT OF GOLD FROM THE USE OF 500 HOSE-PIPES.

500 hose, working 261 days, earn,			$2,610,000
1,000 men on the 500 hose,		$195,750	
Wear and repairs, say $100 per day,		26,100	
1 Superintendent,	$3,000		
50 Captains,	18,250		
Clerk and incidentals in Georgia,	2,000		
		23,250	
New York Expenses and incidentals,		7,500	
			252,600
			$2,357,400
Royalty or Tolls to owners of Gold lands,		$261,000	
400 additional hose-pipes,		44,000	
			305,000
Net profits of working 500 hose,			$2,052,400

Professor Blake, in his report to this Company, estimates, upon the basis of the lowest average results in North Carolina, a certain yield from the Chestatee of about $1,000,000 per annum; but he records *his belief that it will be four or five times that amount.*

Large as these estimates may appear, they are not exaggerated, but are doubtless below what will be the ascertained results. It must be borne in mind that the estimates of placer mining in California and elsewhere, have always been exceeded by the reality.

Yet, though appearing large, these results are not extraordinary. Major Collins, writing from Siberia last year to the Government at Washington, as reported in the *Washington Union* of December last, says—"I saw one miner who employed 1,200 hands in placer diggings. His mines produced last year $1,880,000. Another establishment of 2,000 hands yielded $1,660,000." The 1,200 men there employed are about equal in capacity of performance to 60 of our hose. And yet, in the Ural, the labor equivalent to 60 hose produced nearly what our estimate above calls for as the expected production of 500 hose.

We will now employ another basis of ascertained facts for our estimates, in order that we may see how large are the deposits of gold that we are to draw upon at the rate of some $2,000,000 per annum.

In some of the districts visited by the Commission, the yield, where they had been previously twice worked, was at the rate of $6,000 per acre. In others the rate of production has been $7,000, $8,000, $24,000, and $50,000 per acre. Extend the lowest of these rates over the 20,000 acres controlled by the Chestatee, and we get a product of $120,000,000, as the amount of gold deposited within the area controlled by the waters of our grants, and realizable by the hydraulic method! Professor Blake anticipates a production of $10,000,000, from 1,000 acres of the tract.

"*It will not be possible to find a bank of earth in the district,*" he says, "*in which gold will not be found, and paying a profit to work.*" Out of 42 pansful of surface earth (the earth which never pays by the old process), taken up at random, he found gold in 34. The *whole earth of the placers pays*, when

worked by this all-reaching process, which will enable the hose of this Company to work a million bushels of earth per day! How many rich streaks and leads must come daily within the limits of the million of bushels and the vast area overhauled, disintegrated, and thoroughly washed by the immense extent of hydraulic power that will be applied to the work.

"Along the Chestatee," says the geologist, "*the amount of gold is enormous.*" "On this Company's tracts the gold is very uniformly disseminated." That is to say, the gold is everywhere. Large profits would be certain were even a moderate proportion of the thousands of tons washed daily to pay for working.

It is evident that it is in the *magnitude* of its accomplishment that the gist of this enterprise is contained. Firstly, in the relatively immense amount of labor accomplished by this process as compared with all others. Secondly, in the magnitude of the special application of the process proposed to be made by the Company.

On the other hand, there are features where the reverse of magnitude prevails. No heavy expenses are incurred in getting the product of the Company's labors to market; no losses can occur by those depressions in the market value of the article produced that in other articles frequently sweep away the entire profits of a season's business. The gold once gathered, its market is found at the neighboring mint at its full and unvarying value.

REPORT

UPON THE

GOLD PLACERS

OF A PART OF

LUMPKIN COUNTY, GEORGIA,

AND THE

PRACTICABILITY OF WORKING THEM BY THE HYDRAULIC METHOD, WITH WATER FROM THE CHESTATEE RIVER.

BY

WILLIAM P. BLAKE,

GEOLOGIST AND MINING ENGINEER.

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INTRODUCTORY LETTER.

TO THE PRESIDENT AND DIRECTORS OF THE CHESTATEE HYDRAULIC COMPANY.

GENTLEMEN:—In accordance with your letter of March 29th, requesting me to visit and examine the Gold Region in Georgia, along the Chestatee River, and to report upon the practicability of working the placer deposits by the hydraulic method, with water from the Chestatee River, I visited the region, and herewith submit a report of my observations. It is accompanied by general remarks upon the occurrence of gold and the method of collecting it from placers, with a view, as you desired, to render the subject more generally intelligible, especially to those not familiar with the hydraulic process which has recently been introduced into the Atlantic Gold-field from California, by Dr. M. H. Van Dyke. Desiring to see the results obtained by this gentleman in North Carolina, and thus to be enabled to form a better judgment of the probable results in Georgia, I first visited the placers in Burke and McDowell counties, where the process is now in successful operation. I was much interested to find there an aqueduct for supplying water to the placers, which for extent and execution compares favorably with those in the Gold Region of California. The water is carried for miles around the summits

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of the hills, and across a valley half a mile wide, in a flume supported by trestle-work a hundred feet high. My observations on these placers and their yield, and the facts obtained, enable me to form a more reliable estimate of the results which may be expected from the placers of Georgia.

The report is accompanied by a map, on which I have indicated the direction of the Gold region, and the chief deposits along the streams.

Very respectfully, your obedient serv't,

W. P. BLAKE.

New York, May 8th, 1858.

INTRODUCTION.

ON THE SOURCES OF GOLD IN NATURE.

Gold is obtained in Nature from either veins or beds in the rocks or from placers. In the rocks, it is sometimes diffused throughout the mass in fine particles, but is generally in connection with veins of quartz, through which it ramifies in ragged masses and filaments, or is inclosed in masses of pyrites.

In placers the gold is in loose, rounded masses; in scales or grains, or in impalpable dust, disseminated in gravel, sand and clay, and is transported like them from place to place by water. The gold, like the pebbles, is thus worn into rounded masses and grains by constant rolling and attrition. It is a golden detritus, formed by the breaking down and washing away of the upper portions of pre-existing rocks and veins. The gold is thus in a secondary condition, having been broken from its original matrix, and spread out with the fragments of the rocks and veins over the surface of the country. The great agent of this abrasion and transportation of the rocks was water, often in powerful currents, or river torrents, over what are now the tops of the hills.

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This is proved by the existence of ancient river-beds high above the streams in California, in Georgia, and other gold regions. Along the valleys of rivers now flowing, we find elevated terraces or benches formed of river drift or detritus, precisely like that along the banks of the streams, and also containing gold. Traces of former rivers extend higher up than the well-marked terraces, and there is abundant proof that in the remote past the courses of the rivers were different, and that the volume and velocity of the water were much greater than now. In the changes which have taken place since these ancient streams flowed at such high levels, many ravines and valleys of rapid descent, in which great quantities of detritus and gold have been deposited, are now left entirely dry. These are known among miners as *dry ravines*, and generally yield a large amount of gold.

The size of the fragments of gold in placers is determined, in the first place, by the original size of the masses or filaments in the veins; and, secondly, by the amount of wear to which they have been subjected after their liberation from the inclosing rock. In general, coarse fragments of gold are found with coarse drift, while the much rounded and water-worn pebbles and fine gravel, such as we find in brooks of moderate currents, are accompanied by fine gold, generally in small scales. The wearing of all the fragments of gold among the stones produces a large amount of fine dust, which is disseminated either in the sand or clay.

Thus, by the agency of drainage-water, gold is distributed with gravel over hills and valleys and in the beds of the rivers. In all the deposits the greater part of the gold settles to the bottom, and is generally found resting upon the surface of the rocks, or the *bed-rock* of the miners. It is not laid down in one uniform layer, but by the action of the former currents was concentrated here and there, as in the deposits now forming in rivers. The old deposits, however, being upon high ground, have been more or less worn away by the modern drainage channels, and thus a more perfect and uniform distribution of the gold has resulted.

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A part of it has been washed down into the valleys and deposited in the flats along the streams.

All these accumulations of gold in gravel and sand, which have been broken from veins and beds and spread out by water, are now generally known as Placers or *Placeres*—a Spanish word which has become Anglicized in California. The elevated placers are commonly known in California and Australia as *dry diggings* or *hill diggings*, while in Georgia they are called *surfaces*, and those along the streams are denominated "*deposits*" or *deposit mines*, and correspond to the "bars" and "flats" of the California miner. It is this class of placers—the "deposits"—which has been worked in Georgia and the Carolinas, while, in general, the gold on the hills has not been touched.

The mixed gravel, gold and sand, is commonly known among geologists as auriferous drift, or auriferous detritus, and is frequently referred to by these names in the following report.

REPORT.

DESCRIPTION OF THE REGION.

THE principal gold region of Georgia is confined to a belt from five to ten miles in width, stretching in a northeasterly and southwesterly direction, parallel with the Blue Ridge, through Habersham, White, and Lumpkin counties. The metal was first discovered in Habersham, now White county, in part, in 1829, the placers having been traced southward from North Carolina by the miners; and such was the richness of the placers, that thousands of men were soon engaged in washing the beds of the creeks and rivers. In 1838, a branch of the United States Mint was established at Dahlonega, in Lumpkin county, at one of the most productive parts of the gold-belt, and near the Chestatee River.

My examinations were confined to that portion of the belt extending about twelve miles northwest from Dahlonega, reaching to and across the Chestatee to Loudsville. This region is elevated, though not mountainous, and the surface is smooth and undulating, being furrowed by numerous valleys or hollows, worn by tributaries of the Chestatee. It is covered with a fine growth of pine, oak, and hickory, and is well watered and healthy. The Chestatee is a bold mountain stream, which, taking its rise in the Blue Ridge, flows southwesterly through and across the gold region—and then parallel with it for several miles, finally empties into the Chattahoochee. At the point where it enters the gold region, it is about twenty or thirty yards in width, and from two to three feet deep, and flows with a rapid current; its course being broken at several points by rocky ledges, which cause rapids or waterfalls. Its principal tributa-

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ries, within the gold belt, are the Tessentee, Cavender's creek, Yuhula, and Cane creeks. The banks of the rivers and creek rise rapidly, and the highest hills between the streams reach an elevation of from two hundred to three hundred feet.

GEOLOGY AND THE DEPOSITS OF GOLD.

The rocks of this auriferous belt, between Dahlonega and Loudsville, are ancient or Palæozoic slates and strata of sandstone, uplifted, and much changed or metamorphosed. They are accompanied by ridges or dykes of intruded granite, and are traversed by many veins of quartz. No dykes of greenstone or trap were observed. These rocks appear, here and there, at, and above the surface of the ground, or along the streams, but are generally hid from sight by the overlying gravel and soil, and by the loose earth which results from their decay. The rocks are chiefly mica slate and gneiss; the former being found near Dahlonega in broad and flat slabs, cleaving, like roofing-slate; but towards the Chestatee, and beyond it to the northeast, it has been highly contorted and crumpled up by pressure, and to such an extent, that a water-worn surface of the rock shows a grain like that of an oak knot or excrescence. The trend of the stratification of all these rocks is nearly northeast and southwest. At Dahlonega, the slates dip to the southeast; and along the Chestatee, to the northwest. They cross the Chestatee at the upper ford ("Logan's Ford"), near lot No. 353 of district 15, and form a natural dam, or succession of waterfalls or "shoals."

Just below these rocks a belt of sandstone is found, also trending across the river, and interstratified with the mica slate. This sandstone is much hardened, and has a light buff color and even grain. The strata may be found to be the equivalent of the elastic sandstone or Itacolumite, which occurs in great thickness several miles distant, near the base of Tacoa mountain; also in South Carolina. The Itacolumite is remarkable for its flexibility. Thin slabs may be bent nearly to an angle of forty-five degrees

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without breaking. It is also interesting as the supposed matrix or bed from which diamonds are derived, it having been found with diamonds in Brazil,—where it forms a mountain *Itacolumi*, —in Hindostan, and with diamonds and gold in the Ural mountains. It is known also in North Carolina, where diamonds have been obtained. In Brazil all the rivulets in which diamonds are most abundant, flow from mountains composed of this rock. Diamonds have been found in it, lying between flakes of mica, as garnets occur in mica slate.

According to Prof. Shepard, two diamonds were found in a deposit mine in Hall County, Georgia.* I have no doubt that if the attention of the gold washers was particularly directed to the minerals which are found with the gold in cleaning up, many diamonds would be obtained.

Neither talcose nor clay slates were observed in the region, but probably are developed in the vicinity. Great beds of Steatite, or soapstone, are found on the east side of the Chestatee, not far from Turner's, and are quarried for building-stone, the ease with which it may be shaped and its resistance to fire rendering it desirable for fire-places and chimneys.

The strata of mica slate and gneiss present sharp, upturned edges, and in several places are highly charged with garnets. They are traversed by veins of quartz, of various thicknesses, running with and across the strata. Numbers of these veins are exposed wherever the rocks are uncovered, and there are, doubtless, hundreds and thousands hidden from view by the layer of gravel and soil. It is an interesting fact that some of the very smallest, or thinnest, of these veins bear more gold than the thick ledges, and that in this gold belt gneiss and mica slate appear to be the gold-bearing rocks, it being more common to find auriferous veins in connection with talcose and clay slates. (See Note A, p. 32.)

In the neighborhood of Dahlonega, auriferous quartz veins

* Trans. Amer. Assoc. Geol. and Nat. New Haven, 1845, p 41.

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are very abundant, and may be seen outcropping along the road at many points, and in the streets of the village. Several very rich mines have been and are still worked in this vicinity. Veins are also numerous along the road between Loudsville (Major Logan's) and the Chestatee, and beyond, towards Dahlonega, and on the north of the road.

Gold also occurs disseminated throughout the mass of some portions of the rocks apart from veins. Of this I became satisfied from an examination near the head of Cavender's creek, where there is an outcrop of mica slate, slightly talcose, which has been worked for gold, but no vein is visible.

Granitic rock occurs near Cavender's creek, along the road leading from the Chestatee to Dahlonega, and probably extends for several miles parallel with the belt of gold-bearing rocks. This rock is probably without gold-bearing veins, as there is a narrow strip of country nearly coincident with it which does not yield much gold, and is known as the *poor streak* among the gold-washers of that region. It is said to be from half to three-quarters of a mile wide, and gold is found abundantly on each side.

The exposure of the upper portions of all these rocks, especially the gneiss and mica slate, to the action of the atmosphere and surface waters from the soil, for ages, has produced a very extensive decay and softening, so that they may be cut away with a shovel to a depth of several feet, or washed off by a strong current of water. Even granite becomes so softened that in many places a stick may be pushed into it as easily as into clay. In most places these softened or decayed rocks are very red, from the presence of a large amount of iron-rust, which indicates the former existence of iron-pyrites in them, by the decomposition of which their rapid decay has undoubtedly been promoted. We may regard this pyrites as the matrix of a part of the gold which we find disseminated in the rocks.

A vast amount of drift or detritus of gravel, sand, and clay, resulting from the violent abrasion of these rocks and their in-

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cluded veins during a long period of time, is now spread out over the whole surface of the country ; on the hills and in the valleys or depressions, and along the courses of the present and the ancient beds of streams, precisely as in other gold regions. In Georgia, as in other places, the rivers and creeks have worn new channels and left the old ones dry. The whole surface of the country is cut up by hollows and valleys, which, in their formation, correspond with the dry ravines and gulches of California. Gravel, or river-shingle, is visible on the tops of the hills, and on their sides, resting on the bed-rocks of slate and gneiss. In all this detritus and wreck of the rocks, the fragments of quartz veins are conspicuous, and in some places the drift is chiefly composed of quartz, all the fragments of softer rocks being worn away or decomposed. An examination of this gravel in the usual way shows that gold is almost everywhere present. It is an auriferous drift or alluvia.

The soil or earth of this drift is highly colored by iron-rust, which undoubtedly results from the decomposition of the pyrites which was contained in the auriferous veins, or throughout the mass of the slates or other rocks, and was afterwards distributed through the earth and gravel by the same agencies that carried the gold. In vein mines, where the undecomposed pyrites is raised, it is found very difficult to extract gold from it by mechanical means, but by the decomposition of pyrites in the soil, all the gold is liberated, and in a condition to be readily collected.

Extensive accumulations of the auriferous drift are found in all the valleys of the now flowing creeks and brooks. It is chiefly composed of quartz pebbles and boulders, varying in size from ordinary gravel to the size of the fist, and in some localities to six and eight inches or more in diameter. Where the valleys expand, and there are broad alluvial flats, the gravel i generally overlaid by clay, and is very rich. These are the *deposit*

mines, and were the source of the great yield of gold from 1829 to 1840.

In depth, the drift varies from a few inches to many feet, being in some places over twenty feet thick; but the average thickness may be regarded as from six to ten feet, which is very favorable for washing by the hydraulic method. In Georgia, as in California, and in all auriferous regions, the coarser parts of the drift are found at the bottom, next to the bed-rock. Here, too, we find the bulk of the gold resting upon the rocks in a thin layer, its great weight having carried it below the pebbles when they were moved along under water. It not only rests upon the surface of the rock, but where the slates are loose, and present upturned edges, like the leaves of a book, the gold works down between them for several inches. In washing, it is therefore important to cut off the edges of such slates, so that the gold may be washed. The softened condition of the rock permits this to be easily done.

THE GOLD AND ITS QUALITY.

It is the universal testimony of those who have worked in the placers of Georgia, that the gold is generally in larger lumps and particles, or is coarser, than in the placers of North and South Carolina. The difference in the configuration of the gold belts would lead me to the same conclusion. The general level of the surface of the country is higher, and the valleys narrower and more rapid in descent than in the North Carolina placers; consequently the force of the streams is greater, and the gold drift, and the gold, is coarser.

The quality of the gold is excellent, rarely yielding less than 90 per cent., or 900 parts in 1000, the difference being silver. The standard of gold of the United States consists of 900 parts of gold to 100 of alloy. By the kindness of Col. Barritt, Superintendent of the Mint at Dahlonega, I obtained the following

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averages of a great number of assays of the gold from the principal Georgia mines:

AVERAGES OF ASSAYS.

Auraria, Lumpkin County, vein and placer, - - - -	950
Dahlonega, " " " " - - -	925
Lewis Mine, " " " - - - -	899
Calhoun Vein, " " " - - -	900
New York Vein, Lumpkin County, vein, - - - -	900
Loud Deposit, " " placer, - - -	880
Pasco Mine, Cherokee County, vein, - - - - -	950
Bell Mines, " " " - - - - -	975
Stricklan, " " " - - - - -	950
Elrod, Hall County, " - - - - -	906

If we leave out the assay of the gold from the Loud deposits, which is peculiar for the amount of silver it contains, the average of all these mines is 928 thousandths. The average of the California gold is 875 to 900 parts in a thousand. Gold which assays 900 parts is worth 93 cents a pennyweight at the mint.

EXTENT OF THE PLACERS AND QUANTITY OF GOLD.

The amount of the gold distributed in the drift over the hills and valleys along the Chestatee and its tributaries is enormous, but cannot be calculated with precision. The evidences of its presence are on all sides as we pass over the roads or along the streams, but the fact that it is there in quantities is brought most forcibly to the mind in passing over the excavations made by the miners in the deposits since 1829. The beds of the creeks and brooks have been dug up, and the water now runs among unsightly heaps of gravel or through irregular pits. These old workings are very extensive along Cavender's creek and its branches, from its mouth to its sources; also, along Swindling Branch, and other brooks and rivulets which empty into the Chestatee. Yuhula and Cane creeks, and their branches near Dahlonega, were also extensively worked. All these deposits were rapidly worked over during the excitement which followed the discovery of the gold. From five to ten pennyweights a day

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was the average yield to these early miners. Here and there some enterprising miner, more energetic than others, pushed his excavations into the hill-sides beyond the reach of water, and wheeled or carted the earth to the stream to be washed.

From the following table, taken from the records of the Mint, it will be seen that up to the close of the year 1855, the total production of the Georgia mines, as far as shown by the deposits, was over six millions of dollars:

TABLE SHOWING THE AMOUNT OF GOLD FROM GEORGIA, DEPOSITED AT THE PHILADELPHIA MINT AND DAHLONEGA BRANCH, UP TO THE CLOSE OF THE YEAR 1855.

Period.	Philadelphia.	Dahlonega.	Total.
1828 to 1837	1,763,900 00		1,763,000 00
1838 to 1847	566,316 00	2,978,353 00	3,544,669 00
1848	3,370 00	251,376 00	254,746 00
1849	10,525 00	225,824 00	236,349 00
1850	5,114 00	204,473 00	209,587 00
1851	2,490 00	154,723 00	157,213 00
1852	3,420 00	93,122 00	96,542 00
1853	1,912 00	56,984 00	58,896 00
1854	7,561 00	47,027 00	54,588 00
1855	1,733 50	56,686 36	58,419 86
Total,.....	2,366,341 50	4,068,568 36	6,434,909 86

In addition, I find that 39,681 00 dollars have been deposited at the New Orleans Branch Mint; and 14,342 00 dollars at the Assay Office in New York, making, in all, six millions four hundred and eighty-eight thousand nine hundred and thirty-two dollars, ($6,488,932 00.) The deposits for the first nine years, from 1828 to 1837, amounting to one million seven hundred and sixty-three thousand nine hundred dollars, ($1,763,900 00,) were of gold obtained from the placers or the river flats alone.

The flats and stream deposits are washed very irregularly by the old methods, and a very large part of the ground is left untouched. It is found that they may be worked over a second and third time with profit. Cane Creek on being worked the second time yielded three pennyweights a day to the hand. The deposits along Cavender's Creek, and the other little streams

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leading to the Chestatee, have evidently been but partly worked; in some places at least a third of the surface has never been moved. This arises from the difficulty of working in the old way where the water is continually running, and partly from the accumulation of the washed gravel around the pits.

At the Wilkerson placer in Burke county, North Carolina, I was informed that one acre of it had yielded fifty thousand pennyweights (50,000.)* At another point on the Walton branch, where the gold was first discovered, a free black man had worked over the gravel of about an acre of the old washings, and paid toll upon six thousand pennyweights (6,000.) About the same quantity to the acre, on three acres, was taken out of the placers at Janestown, McDowell Co., North Carolina, in working over the deposits a second time.† Captain Stokes is now working at another part of the same deposits, and the average yield is about the same—6,000 dwts. to the acre; 50,000 dwts were paid as toll from these placers in one year.

In Georgia neither the stream placers or those on the hills are now worked by organized parties or in a systematic way, but a very considerable amount of gold is annually taken from them. There are many persons who work occasionally, a few days at a time, and take out enough to provide for their immediate necessities. Others are engaged in digging and wheeling the earth and gravel from the hill-sides to the water, and washing them in rockers or sluices, thus making about two pennyweights or 180 cents a day to each hand.

On the east side of the Chestatee the deposits called the Loud mines, have long been known as very rich. Last year, a son of Major Logan washed out a mass of gold and quartz half the size of the fist, which weighs 177 pennyweights. This mass was exhibited to me, and for beauty and richness compares favorably

* Statement of Thomas Halburton, overseer for Wm. F. McKesson.

† So stated by Mr. J. H. Forney.

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with the choicest nuggets I have ever seen. Other large masses have been found there at different times, the heaviest weighing 737 dwts., or 36 ounces. This gold, however, is not as fine as the average of the Georgia gold.

It is common for men, and even women, to work by stealth, in remote or secluded parts of the placers, so as to avoid the payment of the percentage or toll to the proprietor of the land. This is called *swindling*, and one of the little creeks or brooks on the lands leased by the company, is known as *Swindling Branch*, from the fact that large quantities of gold have been taken from it without the toll having been paid.

One of the small brooks or rivulets which runs into the Chestatee, has a bed of very coarse gravel and boulders of white quartz, and a very considerable amount of coarse gold has been taken from its bed, and from the foot of the hills along its course. At one point two young white women worked it at different times, and obtained, as is reported, from fifteen to twenty pennyweights each a day. Near the sources of another little brook where the ravine is almost dry, a prospecting pit about eight feet square, sunk sixteen feet to the bed-rock, yielded over ten pennyweights or at the rate of 7,000 dwts. to the acre.

Along all the roads which traverse the gold belt, the indications of gold are very striking to those familiar with auriferous districts. The bright red color of the earth in some places, the quantity of quartz pebbles and boulders, and the long streaks of glistening grains of black sand wherever a little stream of rain-water has flowed, all unite in producing the belief that gold must be there. At Dahlonega the little grains of gold are so abundantly disseminated, that after a shower, the boys often supply themselves with pocket-money by scraping up the sands in the ruts and ripples of the roads, and washing them out in a pan.

Although satisfied by observations that gold was widely and to a great extent uniformly distributed over the whole surface, I caused earth to be dug from different points on the hills and along

the valleys, and panned it out in the usual way. The results were entirely satisfactory. In forty-two trials, a panful, or about three quarts of earth, being taken each time, the metal was found thirty-four times. In most cases, only a speck of gold, or the *color*, as it is called in California, was found; but in others the particles of gold were quite numerous. One panful, No. 9, from the top of one of the hills, contained a rough fragment of coarse gold, weighing about one grain. The pan used in these trials was like those in general use on the Atlantic gold-fields, being a common frying-pan without a handle. The pan in use in California will hold four or five times as much earth. As these experiments may be regarded as important, I add here the notes upon them as they were recorded on the spot, in my note-book.

RESULTS OF PROSPECTING.

No. 1.—Earth and soil from the top of the hill, near Duckett's house.....Gold.
No. 2.—From the roadway on the hill, a few rods north-east of No. 1.....Gold.
No. 3.—From gravel 5 feet below surface, above the level of Swindling Branch, and near the road, no gold.
No. 4.—From gravel near No. 3.....Gold.
No. 5.—From gravel in the roadway.....Gold.
No. 6.—From gravel a few rods beyond No. 3 and No. 4.....Gold.
No. 7.—From gravel and clay near No. 7.....Gold.
It was then found that this gravel did not rest upon the bed-rock, as was supposed, but was a false bed underlaid by clay. The results, therefore, do not give any fair indication of the amount of gold below.
No. 8.—From the top of the hill, east side of Swindling Branch.....Gold.
No. 9.—From the same hill, and near No. 8.....Gold.
This result was very encouraging, the "color" being one fragment weighing about one grain.
No. 10.—From the hill-side one-quarter of a mile north of No. 9.....Gold.
No. 11.— " " " " " ".....Gold.
This earth was near the mouth of one of the dry ravines, where the depth of the drift is about six feet. The particles of gold were very numerous.
No. 12.—From the upper part of the gold-belt, near the head of Swindling Branch.....Gold.
No. 13.—Near No. 12, (3 particles of gold).....Gold.
No. 14.—Top of the hill south of the branch from the surface soil.....Gold.
No. 15.—Soil near No. 14. .....Gold.
At this place the bed-rock was not reached, the sample being taken from the soil on the surface. The rock is Mica slate and contains garnets. Much black sand with the gold.

No. 16.—High up on the hill-soil.....Gold.
No. 17.—Over the hill to another fork of Swindling Branch. From the roots of an overthrown pine.....Gold.
No. 18.—On hill-side at the head of Cavender's Creek.....Gold.
No. 19.—On hill-side, soil, ten rods from No. 18. No color. ——

I then crossed Cavender's Creek at its sources, and ascended to the tops of high hills on the west side. Talcose and mica slate is here developed, and is very red, and softened by decomposition. An excavation has been made on the slate, and the broken fragments taken to the creek to be washed. There were no signs of a quartz vein, but tunnels have been driven into the rock as if in search of one. Two trials, Nos. 20 and 21,

No. 20.—Showed the presence of gold.....Gold.
No. 21.— " " " .....Gold.

The rock itself appears to be charged with gold in very fine particles.

No. 22.—South of the road from Loudsville to Dahlonega and near Duckett's. From the side of the hill near the bottom of the valley, gravel, very coarse, and boulders.....Gold.
No. 23.—From the bed-rock near 22. No color. ——
No. 24.—Same place as 23. No color. ——

The gold is said to be very coarse here, and consequently does not so often give the color in a pan.

No. 25.—Six rods north from 24.....Gold.
No. 26.—Eight rods " " .....Gold.
No. 27.—Nine rods " " .....Gold.

The drift is very coarse here, and the place looks very promising. The samples were not from the bed-rock.

No. 28.—From the top of the hill near the road leading to Logan's Ford....Gold.
No. 29.—From the slope. No color. ——
No. 30.—On Logan's Branch, bank.....Gold.
No. 31.— " " from bank at one side, higher up than No. 30..Gold.
No. 32.—Near 31. No color. ——
No. 33.—Still further up the hill. ——
No. 34.—Near to No. 33.....Gold.

Excavations by the former miners have here extended into the banks on each side of this rivulet. Following up one of the ravines where the bank is exposed, I took sample No. 35.

No. 35.—From a bed of false gravel resting upon clay.....Gold.
No. 36.—From a pile of washed gravel and sand.....Gold.
No. 37.—From the bottom of the opening, near to locality of No. 36.....Gold.
No. 38.—Point of hill above the river, and not far from the road.....Gold.
No. 39.—Same hill, a few feet from No. 38.....Gold.

Then crossing the Chestatee to its eastern bank, some trials were made there, but the bed-rock was not reached.

No. 40.—80 feet above river.....Gold.
No. 41.—On the hill in the roadway.....Gold.
No. 42.—This trial was made in the sand of the road, near Swindling Branch: only about a pint was scooped up in the pan, but a very pretty particle of gold was obtained.....Gold.

These results, though more favorable than I expected, cannot

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be regarded as a fair index of the quantity of the gold in the earth. There was not time to make excavations down to the bed-rock, where the gold mostly lies, and only the surface soil could be taken, except in a few places where, at the sides of the banks of old openings, or along the roads, the lower gravel was exposed. In such places a great part of the gold may have been washed away.

We may form a much more truthful and favorable idea of the amount of gold on the high placers, by referring to the yield of those of North Carolina and California. In McDowell county, North Carolina, where Dr. Van Dyke is now washing away the earth from the hill-sides, high above the streams, by the hydraulic method, the gold is found in the layer of gravel on the bed-rock precisely as in the placers of California, and is collected in the same way. It is not very coarse, but is in irregular grains, of a shape and weight very favorable for collection.

In California, the river placers, or "deposits," were the first which were worked, as in Georgia and California; but have been in great part abandoned for the high placers, from which the great bulk of the gold is now obtained. In these high placers the metal is coarser than along the streams, and, with the aid of water from canals, is more easily collected.

GOLD IN THE BED OF THE RIVER.

At the time the "deposit mines" were most vigorously worked, the amount of gold in the bed of the Chestatee attracted considerable attention. Flat-boats were moored in the stream, and the sands of the bottom were gathered up by boat-shovels. This work was performed in a very rude manner; but two men could fill the boat in a day, and each load yielded from forty to fifty dollars, as I am informed by a resident at Dahlonega. In this way only a small part of any gold which was in the channel could have been obtained; and the fact that, with the disadvan-

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tages of working under water, and raising the earth through it, the returns were remunerative, shows that the bed of the river must be very rich. It is the general belief among the gold miners of that section of the country, that gold to the amount of several millions might be obtained from its bed, if by any means it could be drained, or left dry. A company was once formed by the Hon. J. C. Calhoun, H. M. Clay, and others, to turn the water into a side canal at one of its bends, and thus leave several miles in length of its channel dry. The project was defeated by the refusal of a proprietor to allow the canal to cross his land. If the aqueducts now proposed are constructed, it is probable that the volume of water in the river will be so much diminished during the drouth of summer, that an opportunity will be afforded for working its sands to advantage.

In concluding these observations upon the quantity and the distribution of the gold, I desire to note the similarity of the gold belt to portions of the gold region of California. It is similar in its topography and geology—topographically, in its deep river-valleys, high hills, or divides, between the streams, in its numerous dry hollows and ravines; and, geologically, in its slate-formed hills, seamed with gold-bearing quartz, and covered with layers of auriferous drift. The great difference is in the scale on which the two regions are developed. In California the mountains are higher, the river-valleys deeper, and the gold-drift and alluvia are coarser and more abundant. Georgia, though less favored in these respects, has many advantages which tend to an equalization of profits in working the placers. Foremost among these, are the cheapness of labor, and title to the lands to be worked.

METHOD OF OBTAINING THE GOLD.

The only practicable and economical method for collecting the gold, which is distributed through the soil, is the hydraulic method, as practised in California. It has superseded all the old

and tedious processes for obtaining the gold from the high placers, wherever it is possible to apply it. In this process, the force of a jet of water under great pressure is made available for excavating and washing the auriferous earth. The water issuing in a continuous stream, with great force, from a large hose pipe, like that of a fire engine, is directed against the base of a bank of earth and gravel, and tears it away. The bank is rapidly undermined, the gravel is loosened and violently rolled together, and cleansed from any adhering particle of gold, while the fine sand and clay are carried off in the water. In this manner, hundreds of tons of earth and gravel may be removed, and all the gold it contains liberated and secured with greater ease and expedition than ten tons could be excavated and washed in the old way. By this method, all the earth and gravel of a deposit is moved, washed, and carried off through long sluices by the water, leaving the gold behind. Square acres of earth on the hill-sides may thus be swept away into the hollows, without the aid of a pick or shovel in excavating.* The earth is not handled; in fact, water performs the labor, and moves and washes the earth at one operation, while in excavating by hand the processes are necessarily entirely distinct. The value of the process, and the yield of gold by it as compared with the old methods, can hardly be estimated. The water acts constantly with uniform effect, and can be brought to bear upon almost any point where it would be difficult for men to work. It is especially effective in a region covered with trees, where the tangled roots would greatly retard the labor of workmen. In such places, the stream of water washes out the earth from below, and stump after stump falls before the current, any gold which may have adhered to the roots being washed away.

With a pressure of sixty feet, and a pipe of one and a-half to two inches aperture, over a thousand bushels of earth may be

* For a full description of this process as applied in California, illustrated by drawings, see the writer's Report of a Geological Reconnaissance, in California, 1858.

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washed out from a bank in a day. Thus, earth which contains only the twenty-fifth part of a grain of gold in a bushel, or one-fifth of a cent in value, may be profitably washed.

To wash successfully in this way requires a plentiful supply of water, at an elevation of from fifty to ninety feet above the bed-rock, and a rapid slope or descent from the base of the bank, so that the waste water will run off through the sluices, bearing gravel, sand, and the suspended clay.

The topography of the gold district of Georgia is very favorable to the successful application of this process. The steep slopes of the hills, and the numerous gullies and dry ravines converging towards the principal valleys, afford the rapid drainage which is required for the water and tailings. The Chestatee affords an unfailing supply of water, and in large quantity, which can be conveyed to the gold belt by a canal about twelve miles long, as proposed. Although I have not made an instrumental survey of the proposed course of the canal, I have no doubt that the water would be delivered at the tops of the hills, giving a head or pressure sufficient for washing the whole region below. According to the levels which have been run by Dr. Van Dyke, the lower end of the aqueduct would be about (300) three hundred feet above the river.

In order to reach the Loud deposits, and the placers between them and the Chestatee, and along the eastern bank of this river, also along the Tessentee, water might be advantageously brought by a second canal, lower than the first, so as to take the excess of water from the first dam. Water might be carried across the river from the west side, in a flume, but it would all be required on that side; and as the placers on the east are not as high as those on the west, water to wash them may be procured from the river at a lower point.

In operating in the beds of streams, as on the flats or deposits, where there is no rapid descent for the water or tailings, it becomes necessary to remove the water from the bottom of the pits,

as fast as the washing progresses. The accumulation of water in such places appeared to be an insurmountable obstacle to the employment of the pipes in the deposit mines. The difficulty has, however, been overcome in a very curious manner by Mr. Stokes, one of the captains engaged in washing the deposits at Janestown, North Carolina. It may seem paradoxical to state that the drainage is effected by throwing in a stream of water, but such is the fact. The stream thrown in, however, is under great pressure from a pipe like those used in washing, and a jet or column of water would rise from it, like a fountain, thirty feet or more, if directed into the air. By placing the nozzle of the pipe just below the surface of the water in the pit, and directing it upwards through a larger pipe or box, the jet takes up with it the surrounding water, and discharges it at the upper end, ten feet or more above, or over, the side of the pit. The water rises with such force that sand and coarse gravel are also carried out. The stream from the pipe thus becomes doubled in volume, but rises less than half the distance. In this manner a pit may be kept clear of water while a jet from a pipe is constantly poured in to wash the gravel. Two pipes are thus employed, one to wash the gravel and the other to throw out the water.*

In California the whole art of placer-mining was revolutionized by this hydraulic process, and the production of gold received a fresh and lasting impulse. Square miles of surface on the hills, rich in gold, which have lain untouched, now yield up their treasure to the hydraulic miner. In that region, where labor can scarcely be obtained, and is so costly, water becomes the great substitute for it, and, as we have seen, is more effective and economical in its action than the labor of men. Every inch of water which can be brought to bear upon a placer is valued as the representative, or producer, of a certain amount of

* This method of raising water is not new, although its application to mining probably is. Fields were formerly drained in this way. See Ewbank's "Hydraulics and Mechanics," pp. 477–478. Also, Nicholson's Jour., v. ii.

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gold. Wherever it falls upon the auriferous earth it liberates the precious metal, and if the gold is uniformly distributed through the earth, the amount produced is directly as the quantity of water used.

The ditches or aqueducts for supplying this water, although individual enterprises, compare, in their magnitude and cost, with the most important public works. Millions of dollars are invested in them, and the water which they supply produces the great bulk of the gold now obtained. (Note B.)

Most of these ditches require costly fluming across deep ravines or valleys, and on the course of one of the canals now being constructed, the water is to be carried across a valley in a suspended flume, 2,800 feet in length, sustained by towers rising 130 feet above the bottom of the valley below. These enterprises are seldom undertaken by those engaged in mining, the tenure of the placers being such that water is sold out to each claim at so much per inch for each day of eight or ten hours. When water was first introduced the most extravagant prices were paid for a supply of a few inches, in localities where the yield of gold was very great, and in many cases where the supply was limited the same water was used twice or thrice over, passing from one claim to another, until it became so thick that it would scarcely flow. The price per inch of water in 1851 was about $3.00, so that a claim using twenty inches a day paid sixty dollars for water. The price gradually decreased to fifty cents, and is less at the present time. (Note C.)

The profits from these ditches were at first very great, the receipts of many during a season being equal to the whole cost of construction; others have paid dividends of three per cent, and more, a month on their cost. (Notes B and C.)

These facts are mentioned to show the enormous profits attending this method of washing, and that water, under pressure, upon a gold district may be regarded as the equivalent of gold.

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PROBABLE YIELD.

As no hydraulic mining is yet practised in Georgia, we must form an estimate of the probable yield of its placers by comparing them with those of North Carolina or California, which are now being worked in this manner. A comparison with North Carolina, in respect to the quantity and distribution of gold, has already been made, and it has been seen that in configuration of surface, quantity, and coarseness of the gold, and in the supply of water at a high level, Georgia has decided advantages. The working of the placers of North Carolina, it may be said, has hardly commenced, and the results so far do not fairly exhibit their capacity of production. Several of the best placers are not supplied with water at the most desirable height, and the labor has not yet been systematically organized. The results, therefore, may be considered only as an indication of what may be expected in Georgia were the waters of the Chestatee brought to bear upon its elevated placers.

The average yield, as shown by the results at several of the North Carolina placers, is about six dollars a day to a pipe attended by two men, or by a man and a boy. At some of the placers the average is not less than ten dollars a day. I find, from an examination of the records of the placer at Whitesides, kept from June 1st to Nov. 1st, 1857, that the yield averaged six dollars a day for the whole time, the number of working days being fifty-seven, and the weight of the gold obtained being 442 pennyweights, or, at 90cts., 393.80 dollars. This placer had been worked over two or three times before. At Brindletown, in the bed of a little brook which has a rapid descent, Mr. Hamilton has been washing very successfully with two pipes and five men and boys. A part of the result was taken up for my inspection, and I am confident that the yield cannot be less than twenty dollars a day, even among the former excavations, where the gravel has been washed over more than once before. Mr. Hamilton

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was working up the valley towards the higher part of the creek where the ground, though rich, had never been disturbed, owing to the absence of water. When the water reaches that point there is every reason to expect that the yield will be trebled.

If we take the results which are constantly obtained in Georgia, in many parts of the placers, by persons who work in a small way, and cart the earth from the hills to the water, we must admit that the hydraulic method would be profitable in the highest degree. Two pennyweights a day is the common average yield to these miners; but one stream of water from a pipe should wash out ten times the amount in the same time. At the Wilkerson mine, North Carolina, a portion of the high placer was worked out in the ordinary way, by digging the earth with pick and shovel and washing it in the sluice. From an area of the surface seventy-five feet by sixty feet, or a tenth of an acre square, seven hundred pennyweights were obtained, by the labor of ten men, in thirty-five days, being 2 pennyweights each per day. This amount of earth could have been washed by one stream, on the hydraulic method, in about a week, and the same amount of gold obtained with the labor of only two men. Thus, any earth or gravel which will pay the expense of washing in the old way gives enormous profits by the new process. This yield is at the rate of 7,000 pennyweights to the acre. At Janestown, in three-quarters of an acre of the high placer, six thousand pennyweights of gold were taken up.*

In South Carolina, according to the Report of the State Geologist, Oscar M. Lieber, Esq., at a "deposit mine" in Lancaster district, the yield has been at the rate of 24,000 pennyweights to an acre; 6000 having been obtained from one-quarter of an acre, by four laborers, in two months.†

It is reported that in Siberia the yield of the placers is about 900 dollars a year to each hand employed. (Note D.)

* Dr. M. H. Van Dyke.

† First Report of the Survey of South Carolina, p. 76.

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In all placers, especially those high above the streams, gold is not spread in one uniform layer over the surface of the rock, but is accumulated here and there in quantities greater than in other places. It is the common experience in washing the banks of the earth in California, that the whole earth "pays," or yields gold at a profit from the surface down to the bed-rock, while by the old methods, only the lower layer of earth could be washed with profit. In this difference lies a very great advantage which the hydraulic method possesses; for, by it great masses of earth are so cheaply washed, that in a gold district like that of the Chestatee, none need be left unworked; it would be hardly possible to find a bank which would not yield a profit, though in some cases it might be small. No part of the region would thus escape washing, and the chances of coming upon the rich deposits or leads, where the profits would be enormous, are increased. It is often the case that ancient river beds are reached in the progress of the washings in California, and here the rich streaks and leads are found and followed for long distances across the country, in directions very different from the courses of the present rivers. Some of the river beds are so highly charged with gold, that it may be scooped up by the ounce from the ripples or pockets in the water-worn rocks.

The exceedingly favorable results which I obtained in the trials of the earth by panning, from the hills and dry ravines along the Chestatee, are alone sufficient to convince me that the gold is very uniformly disseminated in greater or less quantity through the earth on the Company's tracts, and throughout that gold belt, and that it can be profitably washed out by the hydraulic method. But the other evidences of the richness of the placers which I have detailed, are more satisfactory, and lead to a more definite and truthful view of the capacity of the region, and the magnitude of the probable results of the enterprise.

I cannot doubt that, with the quantity and pressure of water which may be obtained from the Chestatee, the yield of the

placers will greatly exceed that of those in North Carolina. Even with the disadvantages of the low pressure of the water now in use there, the average yield to each pipe is from five to six dollars a day. At this rate five hundred to six hundred dollars a day can be obtained with 100 pipes, or say fifteen thousand dollars ($15,000) a month. It is one of the great advantages of this method of washing that the number of pipes which may be employed, is limited only by the quantity of water. With five hundred pipes the production might be increased to at least seventy-five thousand dollars ($75,000) a month. In a great part of the region among the dry ravines and narrow valleys, where the gold is concentrated, and the descent for the waste water and tailings is rapid, the yield, in my opinion, based upon all the facts and careful examination of the ground, cannot be less than four or five times as great as the basis of this estimate, or about twenty dollars ($20.00) a day to the pipe.

It is well to remark here, that experience has shown that estimates of the probable yield of gold placers, have generally been below rather than above the results. The estimates made upon the yield of the placers of California, by Mr. King, though regarded as visionary and beyond probability, by many, were exceeded by the results long ago.

We may form an idea of the amount of gold which is distributed over the tract by taking the known production of measured areas in North Carolina, as the basis of an estimate. In the dry ravines and small creeks or branches along the Chestatee and Cavender's creek, I do not doubt that the yield of gold will be found to be greater than was obtained from the deposits in North Carolina. There from 5,000 to 10,000, and 50,000 dwts. to the acre were obtained. The gravel, at many points, still yields from 6,000 to 8,000 dwts. an acre to those who work it over the second time. In the tract of over 6000 acres in the lower part of District 15, on which gold occurs, I estimate that there is not less than 1000 acres from which results fully equal to those of the North

Carolina deposits, may be expected. At 6,000 dollars to the acre, this tract alone should yield six millions of dollars. I cannot, in justice to the facts, or my convictions, make a lower estimate than this, and my opinion is that over ten millions will be obtained. In this estimate the rich deposits at the Loud mines, and along the whole course of the Chestatee and its tributaries on the east side, are left out of view. These might be washed with water from a second canal taken out lower than the first, as indicated on the map. The principal aqueduct could also be extended so as to reach the rich placers along the Yuhula and its branches down to Dahlonega, and beyond.

The numerous dry ravines and hollows, and the rich leads and "pockets," where in the ancient washing by nature the fragments of gold were concentrated, are the great harvest points which, by this method, must certainly be reached in time as the earth flows away before the march of the pipes. One of the great advantages of this process is the uncovering of the whole surface of the rock in succession, as the banks of gravel are washed away.

This will doubtless bring to light very many quartz veins rich in gold, many of them perhaps thin seams, but not less rich, which would repay careful exploration. Particular attention should be directed to this matter by the persons in charge of the operations as they progress. Indeed, many of the vein mines in the Atlantic gold-field were discovered by washing the placers.

This enterprise—the proposed washing of the placers on a large scale—contrasts strongly with ordinary mining operations or vein-mining. In fact, this process of washing is not mining in the strict sense of the word, it is rather a process of *collecting* gold which has already been mined by the operations of nature.

In vein-mining shafts must be sunk through solid rocks, levels cut, adits made for drainage, and tram-roads for transporting the ore; in short, the mine is to be constructed and furnished with machinery before a constant product can be obtained. Compar-

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atively few men can be employed at once, even in the most extensive and best constructed mine, and the ore once raised to the surface is to be crushed and ground, before it is brought to a condition corresponding to that in which it is presented through the operations of nature to the placer miner. Even then, if an undecomposed auriferous pyrites is worked, the gold is not set free by the crushing, and a great part of it is lost in the process of collection. On the other hand, the hydraulic miner takes the auriferous earth which nature has mined; the wreck of a thousand veins is piled up before him. He works upon the surface in the light of day, uses water instead of steel and powder, and extends his operations over hills and valleys. There are no rocks to be crushed, and no pyrites to be decomposed; the gold is all free, and in the condition best adapted for collection. After the water is provided no expensive outlays in machinery, buildings, or construction are required, and the labor may be increased rapidly up to the employment of the whole amount of water. There are no confining walls of rock to check the extent of the operations, and thousands of men might be simultaneously employed.

RECAPITULATION.

The conclusions to which we may arrive from a consideration of the foregoing facts may be briefly stated as follows:—

1st.—That in the region described gold is very generally present in the soil and drift on the hills, hill sides, and in the valleys and dry ravines as in other gold regions.

2d.—That this gold may be most rapidly and economically obtained by the *Hydraulic method*, as practised in California.

3d.—That the deposits of auriferous drift and the configura-

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tion of the surface of the region are highly favorable to the successful application of this process.

4th.—That an abundant and unfailing supply of water may be had from the Chestatee, at an elevation sufficient to wash all the deposits.

5th.—That a yield of from five to twenty dollars a day to each pipe employed may be confidently expected, with the probability of much greater results in some places.

6th.—That obtaining gold by this hydraulic process is not *mining* in the strict sense of the word, but is a process of *collecting* gold which has already been mined by the operations of nature.

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NOTES.

NOTE A.

Gold in Metamorphic Schists and Granite.—Page 9.

In respect to the association of gold with gneiss and granite, the Georgia belt is similar to the gold region of Brazil, and to a portion of the gold region in Siberia. Sir R. I. Murchison, in an address before the Royal Geographical Society of London, in 1844, observes as follows: "Professor Hoffmann has, in his last visit of 1843, discovered a tract in Siberia, in which the very richest gold alluvia occur in a "terrain" exclusively composed of granite and metamorphic schists, the gold being in the latter. Now in the Ural, as in other parts of Siberia, greenstones, syenites, and serpentines seem invariably to have been the agents by which the metamorphic rocks have been rendered auriferous; this discovery, therefore, widens the field of the gold-searchers, and opens out great probable, practical as well as theoretical results. In truth, Siberia and its adjacent regions may be found to contain another Brazil, where granite also is the great ruptive agent of mineralization and metamorphism."

The absence, as far as observed, of dykes of greenstone in the region along the Chestatee, and the presence of granitic dykes in great variety throughout the whole belt of auriferous metamorphic schists of Georgia and the Carolinas, lead me to conclude

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that here also the impregnation of the rocks with gold was due to the inruption of the granite. The auriferous slates of California are chiefly argillaceous and talcose, and, as in the Urals, the greenstones, syenites, and serpentines are the chief eruptive rocks, while on the eastern side of the Sierra Nevada there is reason to believe that gold will be found in connection with more highly metamorphosed rocks and granitic intrusions.

NOTE B.

Ditches or Aqueducts for Mining Purposes in California.—Page 24.

"The construction of ditches [for mining purposes], has become one of the most important branches of industry in the country, and as such, has been jealously protected by the Legislature, where a special act (see printed Statutes of California) has been passed conferring privileges upon such as had the foresight to secure the use of mountain streams, and invest capital in leading them through the mining regions. Some idea may be formed of the extent of this branch of industry from the Annual Report of the State Comptroller for 1855.

It is estimated that at the close of 1855, there were above six hundred miles of ditches in Nevada County. Many of these have been constructed at an expense which would scarcely be credited out of the State where they are being conducted, and which nothing but the absolute certainty of constant and large profits would tempt the proprietors to incur. The Yuba Ditch, running from the South fork of the Yuba River to Nevada and mining vicinity, has already cost upwards of $700,000, and will foot up $1,000,000 when finished. The Combination Ditch, traversing a distance of thirty miles in nearly the same direction,

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cost $500,000. The Sucker Flat Ditch, carrying the waters of the South Yuba a distance of thirty miles to Sucker Flat, cost $300,000. The Middle Yuba Canal Company, whose ditch has already progressed twenty five miles, conducting the waters of the Middle Yuba to the mining locality of San Juan, in Nevada County, have expended $300,000 in their work. These are a few of the greater ditch enterprises among the many which could be cited illustrating the importance of these enterprises. Pieces of property protected by law, giving employment to at least half the mining population of California, based on the known permanency of the gold regions, and not subject to the casualties of fire, failure, or destruction of any kind. Some of these ditches are conducted across valleys and ravines, through tunnels, and along the brow of mountains, and more resemble great public works than individual enterprises." *Report on Shady Creek Ditches, &c.*, 1856. Page 5.

The annual reports of the Surveyor General, and the Comptroller of California, contain much interesting and valuable information respecting the various water companies and the extent of their aqueducts. In the absence, however, of these official documents, I avail myself of some general statements made in a recent and interesting work, entitled "California and its Resources, by Ernest Seyd, London, 1858." These facts were, in part, I presume, obtained from official publications.

"In Placer County are two companies valued at $130,000 each, two at $25,000 each, one at $20,000, another at $14,000, and eighteen smaller ones valued all together at about $55,000.

As these valuations are made by the assessors for taxes, and it not being customary to state the *highest* value for such purposes, it may reasonably be supposed that the value of these works was much higher than the amount stated.

In Amador County there are thirty ditches, with an aggregate length of 300 miles, assessed at $450,000. This estimate of the

length includes not the main ditches only, but also all the innumerable branches, sub-branches, and flumes from six inches to one foot wide, and which naturally much exceed the main ditch in length."

[It is stated in one of the recent numbers of a mining journal in California, that the ditches of Amador County have cost in the aggregate $990,000.]

El Dorado County has twenty ditches, valued at $2,000,000.

Nevada County has forty-four ditches, assessed at $400,000.

Sacramento County, with four ditches, valued at $308,000.

Sierra County has seventy-eight small ditches, assessed at $390,000.

Siskiyou County one ditch, cost $200,000.

Yuba County has eighteen ditches, valued at $180,000.

Mariposa County, unknown what number.

Of all the ditches enumerated, there is not one that pays, after deducting all expenses of repair, management, &c., a dividend of less than 1½ per cent. per month; the majority pay much more, and we know of several that yield from 5 to 8 per cent. per month clear profit, although many of these ditches were constructed at a time when labor, material, lumber, &c., were five times as dear as they are now [1857.]

The following are reported as accurate statements of the profits of some of the California water companies:—

Columbian Water Company,	4	per cent.	per	month.
Canal on Rich Gulch,	12	"	"	"
Ditch on the head of Rich Gulch,	6	"	"	"
Two Flumes in Butte County,	5	"	"	"
Prairie City Canal Company,	3	"	"	"
Coon Hollow Canal,	10	"	"	"
Two Ditches at Coloma,	5	"	"	"
Rock Creek Ditch, near Georgetown,	5	"	"	"
Natoma Water Works, (Mormon Island),	12	"	"	"
Auburn and Bear River,	20	"	"	annum.

All these are works made by capital borrowed at extravagant rates of interest.

A small ditch at Jackson, which cost $1,700, pays $100 a day.

The South Fork of the American River Canal, cost between $600,000 and $700,000, and yields a profit of $2,500 per week Constructed with borrowed capital at 5 per cent. per month.

The water Companies in Nevada County, pay from 6 to 30 per cent. per month." p. 37–38.

I obtained the following statements from a gentleman who resided in California from 1849 to 1854.

The Bear River and Auburn canal, about 60 miles in length, cost in all including an extension $1,600,000. The receipts were, in 1853, about $3,000 a day. This ditch was about 4 feet broad at top, and 3 feet deep.

The South Fork canal, American River, about 20 miles in length, 6 feet wide and 3 deep, cost over $600,000, and in 1853, when only six inches of depth of water could be obtained in it, as much as 2,100 dollars had been realized from the sale of water in one day.

The Natoma canal, 14 miles long, near Sacramento, passing Mormon Island, and supplying what were called the *prairie diggings*, cost $160,000, and yielded 500 dollars a day for the sale of water.

I have compiled the following table from a Report on the Shady Creek ditches, California, made in 1856.

TABLE SHOWING THE AMOUNT RECEIVED FOR WATER FROM THE SHADY CREEK DITCHES, IN CALIFORNIA, IN SEVEN WEEKS.

1854.	June.	Cash receipts for five days from	12	Companies,					$311 00
	May.	" "	one week	"	13	"			449 00
1855.	May.	" "	"	"	17	"			813 72
	June.	" "	"	"	14	"			639 99
1856.	Jan.	" "	"	"	20	"			1,203 10
	Jan.	" "	"	"	21	"			1,505 05
	Jan. & Feb.	" "	"	"	23	"			1,844 00
									$6,755 86

Total receipts for water for seven weeks, $6,755 86

This table is given chiefly to show the gradual increase in the sale of water as new claims were opened from year to year. These ditches were small, and could supply water for a part of the year only. The same ditches according to a table of later date, supplied 7,645 inches of water in one week, "which at 30 cents per inch, gives $2,293, or equal to $9,936 per month. This shows an annual return from the sale of water of $129,236, or after deducting expenses, equal to more than 4⅓ per cent. on an investment of $2,000,000. These amounts are reckoned without counting the sum of at least $10,000 per year received from the long sluices. There are now 44 companies supplied. Eight months in the year there is an abundance of water to more than meet all future demand, even for 100 companies using 500 inches per week each."

NOTE C.

Prices of Water for Mining Purposes in California, Page 24.

"Water was first brought to the Nevada Hills by the Rock Creek Ditch. This was seven miles in length, cost about $14,000, and yielded, from the sale of water, $30,000 in the first two months. Water was sold several times over, or, rather, it was used by several parties in succession, until from the quantity of fine slime in suspension, it became as thick as pudding, and would no longer run. For a supply of eight inches, the first parties paid two ounces a day; the second, twenty-four dollars; the third, one ounce, and so on down to four dollars. The aqueduct was afterwards sold for about three times its original cost, and has since paid fair dividends even for California. Water is now sold for fifty cents an inch, [1854.] The aqueduct of the

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Deer Creek Company is said to have cost $25,000, and to have paid all the expenses of construction in the first three months."—*See the Author's Report of a Geological Reconnaissance in California, &c.* NEW YORK, 1858. Page 268.

NOTE D.

Gold Produce of Siberia.—Page 26.

"In Russia, as in the Brazils, the great mass of the metals is derived from local detritus or alluvia usually called gold-sand, but for which (as far as Russia is concerned) the term of shingle would be much more appropriate. With very trifling exceptions, all such auriferous detritus in the Russian Empire occur on the eastern or Siberian side of the Ural. Slightly known, and near Ekaterinburg only, in the days of Pallas, it was not until the reign of Paul and Alexander, that these gold alluvia were found to extend in a certain zone to the north and south of that locality, throughout 5° or 6° of latitude, and that eventually gold was extracted from them to the annual value of about half a million sterling. Notwithstanding the increased exploration of late years, and many researches in the northern and southern portion of the chain, this quantity has rarely been exceeded, and latterly, the alluvia in some tracts being exhausted, it has begun to decrease. The reign of the Emperor Nicholas has, however, been distinguished by the important discovery that portions of the great *eastern* regions of Siberia are highly auriferous, viz.: in the governments of Tomsk and Yeniseik, where low ridges, similarly constructed to those on the eastern flank of the Ural, and like them trending from north to south, appear as offsets from the great east and west chain of the Altai which separates Siberia from China. And here it is curious to remark, that a

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very few years ago this distant region did not afford a third part of the gold which the Ural produced, but by recent researches an augmentation so rapid and extraordinary has taken place, that in the last year the eastern Siberian tracts yielded considerably upwards of two millions and a quarter sterling, raising the total gold produce of the Russian Empire to *near three millions sterling!*"—*Sir Roderick I. Murchison's Anniversary Discourse before Royal Geographical Society of London in* 1844.

The following statement is taken from a letter written by Major Collins from Irkoutsk, to the government at Washington, and published in the *Union* and *Mining Magazine.*

"While speaking of gold, I will state some facts learned here. (Irkoutsk.) I saw one miner who employed 1,200 men in 'placer diggings' 1,000 versts to the northeast of this place, on a stream that falls into the Lena. His mines produced last year 150 poods of gold, which, at 36 of our pounds to the pood, gives 5,406 pounds; estimating the value of a pound of gold (roughly) at $206, will give $1,800,000 or $900 to the hand; and owing to the severity of the climate, but five months in the year can be employed in labor. Another establishment, of 2,000 hands, yielded $828 to the hand. This certainly will compare favorably with the mines of California."—*Mining Magazine*, Vol. X. p. 95.